Submission by the Barrington-Gloucester-Stroud Preservation Alliance

on the
AGL GLOUCESTER COAL SEAM GAS PROJECT

(MP080154)

ENVIRONMENTAL ASSESSMENT

This submission is in response to the Environmental Assessment prepared for the AGL Gloucester Coal Seam Gas Project (MP080154). The submission addresses the issues in the sequence they are addressed in the AGL Environmental Assessment. This has presented some problems because some topics are considered in more than one section of the AGL assessment. However, it provides a reasonable sequence and allows the relevant section(s) to be located. The issues addressed in the submission do not cover all areas of concern but cover the issues that could be addressed within the limited time available. In this sense they should be seen as illustrative examples rather than an exhaustive coverage.

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SECTIONS 5, 12, 13 - WATER

Production Water

The disposal of produced water generated by the extraction of CSG is addressed in some detail in the concept plan. The preferred option to partially purify the produced water using reverse osmosis, to sell the treated water for local agricultural use and to separately dispose of the solids removed is attractive on the face of it. There are a number of issues that have not been addressed adequately or in some cases at all.

Treated Water Quality

No commitment is made to treating the water to any specified standard. It is said that it will be treated to 'acceptable standards' without saying what standard or to whom it might be acceptable.

In the illustrative example of Stage One development 2ML per day would be processed, which initially contains TDS of 2000 mg/L to yield 250 KL per day of brine which would contain 3 tonnes of solids. This implies that the treated water of 1.75 ML/day would carry the remaining 1 tonne of solids and so contain about 570 mg/L TDS. In terms of TDS alone such water would be suitable for stock drinking water and could be suitable for irrigation of some crops depending on the nature of the soil that the crop was grown in. As the soils of the area often have high clay content the risk of damaging the soil with sodium salts needs to be evaluated before any farmer plans long-term irrigation.

The volume of the produced water and its solid content is based on few trial wells and cannot be extrapolated to the whole gas field.

No reference is provided about the existing quality of water in the local rivers. Monitoring by local groups suggests that the TDS varies with rainfall between 110 and 260 mg/L. Discharging high volumes of water with much higher TDS will impact the rivers. How significant the impact will be requires further study.

No data has been supplied on the pH of the produced or treated water nor is there any analysis of the solid content. So the possibility of the long-term application of treated water producing a harmful accumulation of metals or other toxins in the soil or stock is unknown, as is the effect on local waterways.

Treated Water Disposal

The direct discharge of treated water into local waterways is foreshadowed in the case of demand for irrigation being reduced because of rain. No analysis is provided of how often or how much such discharge might be. We have already seen how miners in the district can be unduly optimistic about containing waste water during wet spells. This matter is put off to a future study.

The possibility that farmers may not want the treated water due to unsuitable quality, irrigation being uneconomic or any other reason is not considered. In that case there would be little option but to discharge the balance into the rivers.

Thus we are left with the possibility that under full development of the project up to 5.25 ML per day (using the proponent's figures) of water of unknown quality will be discharged into local waterways for 15 years or more. It may be that the volume of produced water and its dissolved solids has been underestimated. This discharge would be on top of the water already discharged by Gloucester Coal's Stratford mine, a cumulative impact that is not considered.

To give approval in principle to this project before any study is conducted as to the likelihood, or volume of discharge, or its consequences to the river systems would be irresponsible. Given the multitude of uncertainties it is hard to understand how water management is rated only a medium priority in the Executive Summary.

Ground Water

The concept plan concedes that the geology of the concept area is complex and highly faulted. Coal miners in the area have confirmed this in their diggings. The proposal gives very little information about the depth and flow of aquifers. The hydrology of the valley is generally poorly understood.

The following opinion by Professor Alex Grady outlines the extent of this problem. (Professor Grady has 35 years as a geologist specialising in structural geology and also has extensive experience as a geological field mapper. He has extensive field experience in NSW, South Australia, Western Australia, the Northern Territory, New Zealand and Eastern Indonesia. He was during that time a Member of the Australasian Institute of Mining and Metallurgy and of the Geological Society of Australia and retains membership of the Geological Society of Australia.)

> The area in question has been intensely faulted, involving several intersecting arrays of often closely spaced faults. This is the kind of geological situation in which the rocks are usually strongly fractured (fractures due to compaction-contraction during lithification, together with those due to brittle failure during folding and faulting). This gives rise to secondary porosity/permeability - which can vary considerably from place to place. Most particularly, such effects can produce locally high porosity/permeability zones in rock units that have low primary porosity/permeability (producing what are called "fractured rock aquifers").
>
> There are sandstone stratigraphic units within the geological sequence, ones that could well be fairly good local aquifers (although the water quality might not be particularly good). The sedimentary units in the Gloucester Valley area are not pure "layer cake stratigraphy", ie, sedimentary units are not perfectly continuous (in extent or thickness - particularly from east to west). This applies also to the character of the mapped rock units, eg the distribution of potentially good sedimentary aquifers. The fact that their drilling activity in the pilot project area didn't intersect any doesn't preclude their existence within the proposed Gas Field area.
>
> The complexity of the faulting is likely to have juxtaposed the coal seams with potential sandstone aquifers in many places. This has the potential to make the coal seams 'leaky' in such places.

The proponent asserts that their test wells did not "appear to have affected the water levels in alluvial aquifers". The inference being offered that this is some sort of evidence that the same situation would apply across the gas field is not supported by current knowledge of the geology.

Prof. Grady is also of the opinion that:

> Their report of what happened to neighbouring core drill holes (DDH20C and "an unnamed core hole " about 400m north of LMG03) suggest greater permeability/porosity than they otherwise admit, within the coal seam sequences (not just within the coal seams).

The proponent makes much of the efforts they will make to case and seal each well into its surrounding strata. The possibility that fraccing may open up communications between wells (old or new) or between permeable strata that were previously isolated is not considered.

A monitoring regime to detect production wells that are extracting water from aquifers is proposed. The remedy offered if that problem is identified is to shut down the well. No indication is given how many wells might be so affected, probably because nobody knows.

The proponent intends to devise contingency measures if other adverse impacts are detected. Whether the monitoring regime is capable of detecting such problems, such as water or gas flows other than out of the wells, in a reasonable time is unclear, as is what might be done about it. If fraccing has opened an undesirable communication pathway then shutting down a well is not going to fix it unless the pathway is only to that well.

All the indications are that a detailed hydrological study would be required to determine the impact of the project upon ground water because at present there is no solid information about it and there are indications that there will be effects. The proponent has committed to such a study but only after stage 1 GFDA is providing data (see 26.2.1 #12). Likewise the Groundwater Management Plan has been put off until after approval. How is this possible given the uncertain environment?

The monitoring installations will only collect useable data once the wells of GFDA 1 are established and in production. They can only be put into production once the CPF and pipeline are available unless all the gas will be flared locally. So in practice the hydrological study will be undertaken after the project is approved and operational.

Is the proponent prepared to gamble a huge capital investment on the outcome of such a retrospective study? Or are they assuming that no matter what the outcome of the study, no matter what environmental consequences may be revealed, they will not be compelled to take any action that would seriously compromise production?

Conclusion and Recommendations

An independent study of the disposal of produced water and of groundwater hydrology is required. This should be conducted before the concept plan is approved unless the State Government is prepared to gamble along with the proponent that no serious harm can come to the environment as a result of the uncertain water management of the project.

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SECTION 6 – HEALTH

HEALTH IMPACTS ARE THE HIGHEST PUBLIC PRIORITY AND ARE CUMULATIVE.

In any Environmental Assessment (EA) the general public will usually believe the impact on humans is the most important factor and highest on their priorities will be any adverse health impacts a project may have. Traditionally in EA's whilst multiple factors are assessed, strangely there is no health impact assessment routinely requested. Regrettably this EA also omitted to specifically address this vital aspect. Noise and Air Quality assessments cover some of the health impacts but the psychological impact is totally neglected. Health impacts are invariably cumulative and this current proposal overlaps the area impacted by Stratford Coal Mine. The principal emissions from the gas project also are common to some of those from Stratford Mine.

It is imperative that any proper Environmental Assessment estimate the extent of the already existing health damage from Stratford Mine and the health consequences of adding further physical and psychological stressors to an already compromised population. (The total failure of the Cumulative Impacts section of this EA to recognize that the local community is already overwhelmed by the cumulative impacts of multiple mining projects casts serious questions about whether AECOM and AGL are being deliberately deceptive or just incompetent in this regard). It is regrettable the Dept of Planning does not automatically require input from the Dept of Health on projects which pose significant risks to public health. The health risks to stock have similarly been overlooked.

AIR QUALITY ASSESSMENT

The health impacts of gas mining are virtually un-researched, which should breed extreme caution in planners. (References provided in this submission relate to the health effects of coal dust but some of the most toxic chemicals are also emitted in Gas Mining). Five dangerous chemicals emitted during flaring and production are nominated in the EA but the discussion of them includes many mistakes and serious omissions. The dangerous substances (principally heavy vehicle exhaust emissions) emitted during the construction phase were not discussed. Flaring emissions have not been analysed. The interaction of these emissions with the emissions from Stratford Mine was totally neglected despite the preferred site for the CPF being close to the Mine.

The most serious misconception relates to PM10 particles. This size of particle should be described as coarse (not 'fine'). It is produced by mechanical processes such as earth moving involved with the construction phase. Particles of this size are a nuisance but they are too big to enter the lung tissue and are largely irrelevant to health damage effects. The particles which enter the lung have to be less than PM3 and particles of this size are mainly produced by combustion processes (heavy machinery use, flaring). These fine particles constitute the principal dangers associated with this project. Because they are derived from a totally different source the PM10 levels bear no relationship to PM2.5 and PM1 levels which are what need

to be monitored. Many much smaller ultrafine particles will also be produced but they probably are too small to have the devastating effects of PM1 and PM2.5 particles.

Stratford Mine has started informing the NPI of its PM2.5 output this year but whether this is a 'guestimate' or a proper study needs to be determined. The lung function of Stratford residents may well be already compromised by these fine particles coming from the heavy vehicles exhaust gases, blasting gases and burning coal seams of the mine. Fine particulate matter travels much further than PM10 so that PM2.5 released at the top of a 12metre stack at the CPF will potentially travel on the wind for kilometres until the cool of the evening causes the particles to settle.

In the UK, Dr van Steenis stated tests showed a large bulldozer may emit the same number of particles as 900,000 P70 Volvo cars. These particles are of the harmful, fine PM2.5 and PM1 size range. Short-term exposure will trigger asthma attacks in the predisposed and long term exposure will cause new cases. Bulldozers and other machinery emitting diesel fumes need to have the maximum possible exhaust suppression equipment.

Nitrous Oxides react with substances in the air to form fine PM2.5 particles and they combine with water in the atmosphere to form nitrous and nitric acid. This interacts with coal dust deposited in peoples gutters and releases heavy metal poisons such as cadmium, lead, mercury, arsenic etc. The Stratford village has a school and residences with tank water and this will need careful monitoring as of course will all the 118 residences i.e.300+ people in the GFDA. The site of CPF7 is only 300metres from the nearest private residence. Fraccing chemicals have caused health damage to humans and stock in the past and a condition should be placed on any gas project now that non toxic chemicals be used in this procedure.

Stock in the area, like the humans, will be at risk of compromised lung function in the short term and other organ involvement with long term exposure. The action of carcinogens and substances causing genetic malformations in the VOC's will apply to humans and stock. Dairy farmers should be very vigilant for contamination of milk with heavy metal poisons released from coal dust settling on pasture and interacting with nitrous oxide fumes from gas mining.

NOISE

Once again the inappropriateness of a development such as this to be sited in a comparatively densely populated rural community can be seen:-
The conclusion of Atkins is that "some well construction works in the GFDA including drilling and preparing for fraccing will occur 24hours a day……Noise modeling has shown there would be situations where construction noise levels exceed the target assessment goals"

If AECOM had sought community input they would have discovered the 118 residencies within the GFDA were part of a community survey on impacts of mining taken by 'The Alliance' in 2006. Noise was complained of by 85% of respondents and was the most common problem nominated. The notion of what is acceptable from the

Department's point of view seems to be widely disparate from what is distressing to the resident in an affected area. Again the cumulative impact of mining noises is very relevant. Noise is invariably complained about at night-time when temperature

inversions etc make it more noticeable and it disturbs sleep. The frustration and sleeplessness play a big part in the psychological problems e.g depression and anxiety which will be further increased should this project go ahead. Constant noise impairs concentration and learning and this (along with PM2.5 induced vascular damage) almost certainly contributes to the reduction in IQ's and increased behaviour problems found in children in mining areas. Sound proofing of Stratford School needs to be implemented.

Noise Monitoring needs to include low frequency, subsonic noise which can resonate in cavities of a room or body cavities such as the skull and chest and impair function. Noise monitoring should not be restricted to outside measurements where this effect does not come into play.

PSYCHOLOGICAL STRESS

Gloucester is a town in crisis that has been caused by the effects of multiple, largely unwanted mining ventures. This has lead to a public meeting with 1000 people objecting to proposed mining and also to the spill of our previous mayor. The 2006 'Alliance' mining effects community survey showed a number of components combined to cause stress in an individual. For some the changed appearance of the landscape was very distressing. This is described in detail in the literature about 'Solastalgia'. The section of the report on 'Visual Impact' belittled this aspect by stating only half of the residences would be able to see a well or the CPF with its stacks and lightning diverters.

Obviously it is not just what you can see from your house that has an impact on you. For many the necessity to change life plans was a stressor. For others it was the decrease in real estate value amounting in some cases to the impossibility of being able to sell their property to escape. The powerlessness of being a victim in a larger game in which they had no influence promoted feelings of depression. Increased stress tends to lead to a reactivation of past psychological disorders currently in remission but may also result in new cases. Psychological stress also causes physical health problems such as raised blood pressure. This aspect needs to be monitored.

SAFETY

The public perception of the gas and oil industry is that it is a dangerous industry. This is not without foundation with disasters such as the 177 deaths in the Piper Alpha disaster, the Moura mine explosion killing 11 men, the Longford Gas explosion with 2 deaths and 8 serious injuries, the June 2008 explosion at the Apache Energy gas plant in West Australia on Varanus Island etc, etc.

Locally in 2004 a gas migration incident occurred at Stratford and shut down operations. This resulted from one of the unknown several thousand old bore holes in this area linking up with gas released by fraccing. The very fractured nature of the

local geology together with the many unknown old holes makes this type of incident likely to be repeated. The section on Hazard Analysis makes no mention of this incident or the above factors and this glaring omission hardly engenders confidence in their conclusions.

The report points out the proximity of houses particularly in the Craven area to the planned pipeline with the nearest residence being only 15metres away. Inevitably risks such as bushfire, subsidence from unknown old excavation and lightning could cause a disastrous explosion and close to Newcastle earthquakes are another unpredictable possibility. Steel pipes can succumb to brittle fracture such as occurred at the Longford gas explosion etc. It is inappropriate to lay a pipeline so close to people's homes. Flare operation risks were not assessed because of the uncertainty of the exact siting of wells. Will they ever be assessed?

GLOBAL WARMING

This project will further accelerate global warming which has numerous adverse health impacts summarized in a document from the US Physicians for Social Responsibility.

CONCLUSION

Health impacts of this project need total revision. Community rage about health damage is leading to class action being planned elsewhere. If this project goes ahead AGL and the State Government need to put aside many millions of dollars to cover this problem which is the new 'asbestos' in our community.

The mining industry wants to make a profit and this inevitably brings about pressures on individual workers to cut corners. Human beings are never perfect and mistakes inevitably happen from time to time. The interaction of these two factors explains many of the numerous disasters that occur. Each disaster is followed by an inquiry and each inquiry by another disaster. The safest course of action is to limit mining to very sparsely populated areas. Gloucester is a relatively densely populated rural area which already has coal mining inappropriately situated. This inappropriate mining needs to be gradually withdrawn, not added to.

References (Copies included)

1) Death, disease and dirty power. Oct 2000 Report of US Clean Air Task Force
2) Coal, Open casting and health. March2008 report by Dr Dick van Steenis
3) Coal's Assault on Human Health Nov 2009 Report from Physicians for Social Responsibility

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SECTION 12 - FLOOD IMPACT

(A flood assessment of the stage 1 project area and the concept area is required under the Director-General's Environmental Assessment Requirements to assess Surface and Ground Water and also under Hazards and Risk Impacts.)

1. SUMMARY

This submission considers a full and proper assessment of flood impact has not been undertaken and urges the Minister to ensure that approval for both the Stage 1 project and the Concept Plan not be considered until this has been completed.

Data and evidence describing the extent and nature of flooding in the Gloucester and Avon River floodplains are provided further below in this submission.

2. THE AGL ENVIRONMENTAL ASSESSMENT FAILS TO ADEQUATELY ADDRESS FLOOD IMPACT

Issues not addressed

The AGL Environmental Assessment fails to adequately address flood impact because it fails to determine the extent and nature of potential flooding in the Gloucester and Avon River valleys in regard to both the Stage 1 area and the Concept Plan Area. The environmental assessment has not properly addressed the locations of the gas wells and related infrastructure in relation to flood liable land. It therefore has not adequately addressed the impact of the wells and related infrastructure on water flow and has not adequately addressed the risk impact of flood on the wells and related infrastructure.

Flood risk on the Avon River is far in excess of that envisaged by the assessment
It is clear that some well head sites on the Avon River and Waukivory Creek floodplain flats could be at risk of serious flooding, for example more than a metre depth, persisting for more than a day. Total depth and duration of inundation has not been assessed because a flood assessment has not be undertaken. A resident in this area (details can be supplied) advises that his property on the Avon River has experienced rises during light flooding of six metres and that AGL crews are drilling on his property on areas that were inundated. This raises the critical issue that the environmental assessment has seriously underestimated the flood risk and that flood levels of this nature could have serious impact on all aspects of the development.

The absence of details concerning the number, exact location and construction of the brine ponds is an omission. There is a serious risk of major longterm environmental damage if the operation of the brine ponds is compromised by excessive rainfall, surface run-off or flood inundation. The brine ponds are acknowledged as having high containing walls but intensive rainfall incidents, flood depths and flood velocity have not been assessed. Data concerning flood risk and rainfall variability is provided further below in this submission.

Examples of deficiencies noted in the Environmental Assessment. (These are illustrative rather than exhaustive).

- The Environmental Assessment identifies that the Avon River experiences flooding (page 12-2) but does not assess to what extent in terms of area, depth and velocity. The section then attempts to downgrade flood risk.

- Claims wells will not impede flood flow (page 12-22) but has not assessed flood flow and provides no supporting evidence of this claim.

- Acknowledges possible 'localised' flood disruption by plant and equipment (page 12-17) but does quantify or define in any way.

- Acknowledges the need for a flood warning system and that a flood warning system will be implemented (page 12-23) but provides no details. This is a critical matter that must be addressed before approval is given.

- Will relocate unsecured equipment when flood warnings are received (page 12-22) but provides no indication of how this will happen, who makes the decision and how it will be made.

- Acknowledges the risk of damage to plant and infrastructure and the need to rehabilitate plant and infrastructure after flood (page 12-23) but provides no detail of what damage may occur and what rehabilitation will be necessary.

- Acknowledges need to avoid having structures on flood prone area (page 12-28) but does not justify having wells and infrastructure on flood prone areas.

- Acknowledges the need to keep construction spoils and earth away from flood prone areas (page 12-23) but has not defined those areas and cannot therefore fill this requirement.

3. HISTORIC EVIDENCE OF THE VALLEY'S SUSCEPTIBILITY TO FLOOD

A full flood study has not yet been undertaken

A flood study of these two river valleys has not yet been undertaken. The Gloucester Flood Management Study 2004 assessed the 'floodplain process' for Gloucester township and its immediate environs only. This means that a flood study has not been undertaken for the major part of the project area. The extrapolation of data from the flood management plan to those areas not addressed in the management plan would be fraught with potential error if a reliable document is sought. However, sufficient anecdotal evidence, newspaper reports, recorded or photographed evidence and insurance claim data are available to show that a substantial part of the area is flood prone, both by way of water rising from the Gloucester and Avon Rivers to inundate surrounding land or by water unable to drain quickly from the area because of unsuitable gradients and obstruction to surface flow.

There is evidence of major flooding occurring from 1857, which is the first recorded

flood. Files from the Gloucester Historical Society reproduced in the study by Willing
and Partners, 2001, provide evidence of floods in 1857, 1867, 1875, 1878, and 1893 with two smaller events reported in 1871 and 1872. The February 1929 flood was the highest recorded and inundated shops in Gloucester's main street to a depth of approximately 1200mm. Later floods occurred in 1956, 1957, 1974 and 1978.

Characteristics of the Gloucester floods.
Historical evidence shows that the flood waters rise quickly and travel quickly, and this was noted as a feature of the Gloucester floods in the Gloucester Flood Study, Supplementary report 2004. In the 1878 flood two men lost their lives crossing The Billabong and in the 1929 flood two men lost their lives while attempting to cross between the Royal Hotel and Park Street to rescue hotel guests.

The Gloucester River appears to be the faster flowing of the two rivers but an assessment of velocity has not been undertaken. It is urgently required. However, a second characteristic affects the Avon River - the long gradual gradient from south of Stratford and the reduction in drainage velocity because of the wetlands in its lower reaches near Gloucester cause localised flooding that is sometimes inconsistent with other river flows in the catchment area. To complicate the matter, this is potentially being altered by changes to the river's drainage at the Gloucester wetlands and tree planting programs being carried out in the same area.

Rainfall variation and future flooding
Official rainfall data from the New South Wales Bureau of Meteorology shows that the Gloucester area and the Manning River catchment area have a rainfall variation factor that is consistent with the New South Wales coastal plain and eastern highlands generally. Considered as a simple measurement of extreme variation, the wettest 12 months receive approximately double the average annual rainfall and the driest twelve months receive approximately half the average annual rainfall. Gloucester, as a representative station for the total catchment area, is consistent with this – the average annual rainfall is 984 millimetres, and 1894 as the wettest calendar year received 1875 millimetres. However, that is increased by considering the twelve months period from November 1892 to October 1893, during which time 2068 millimetres fell.

However, the most relevant statistic is not so much the annual rainfall but the intensive falls in shorter periods of a week or less. Statistics to assess this were not available but falls for individual months give some basis for assessment. The big flood of February 1929, for example, is highlighted by a massive 752.4 millimetres during that month. Although conclusive predictions cannot be drawn, the available data indicates that the recorded floods may not be the most severe to affect the area, both in the past and in the future. Rainfall over the entire catchment, in terms of the amount, the duration or intensity and the sequence in which the various parts of the catchment receive rain are all factors.

There are further factors that need to be taken into account – the greater extent of land clearing in modern years, for example since the 1929 flood, and predictions of increased storm activity due to climate change argue for increased flood susceptibility.

SECTION 9 - AIR QUALITY

This section of the Environmental Assessment considers the effects of the proposed development on air quality in the Gloucester Stroud Valley as a consequence of the proposed gas field and ancillary developments. It is associated with an Appendix, prepared by the same firm of consultants, which presents the outcomes from various pollutant dispersion modelling exercises.

The first significant statement in this chapter of Volume I of the EA is found at the beginning of Section 9.2.1. It reads:

> Air quality in the Gloucester basin is predominantly agricultural emissions with lesser contributions from coal mining operations and vehicular traffic moving along the Bucketts Way.

The opening sentence of Chapter 3.0 in Appendix F reads:

> The main sources of air pollution in the Gloucester basin are coal mining operations. Vehicle traffic along the main roadway (The Bucketts Way) and wood smoke during the colder months would also contribute to pollutant levels.

The contrast between the two above statements is striking and can only be viewed as an attempt by the authors to exclude the impacts of Gloucester Coal's open cut mining, coal washing, and transport operations from consideration in assessing the existing air quality profile of the Gloucester- Stroud Valley.

Appendix F goes on to remark that :

> No publicly available air quality monitoring data were identified for the Stratford region.

This is puzzling, because Gloucester Coal has been conducting regular monitoring, as required under its mining licence approval, since the commencement of operations at Stratford in 1996. Quarterly reports are presented to the CCC and also forwarded to relevant Government Departments.

A reference is also made to the National Pollutant Inventory (NPI), which uses postcode areas as its geographical reporting unit:

> A review of the NPI was undertaken of the local area (postcode 2422) in order to assess the local air quality. The Stratford Coal Mine, situated 1.5 km to the southeast of Stratford, is the only facility in the Stratford postcode area (which includes Gloucester) required to report to the NPI. The pollutant emissions from this facility are all ranked as low compared to other facilities and pollutant sources.

As no further comment is made, it is not possible to resolve the ambiguity as to whether the **'other facilities and pollutant sources'** referred to are those located in postcode area 2422, or comparable open cut coal mines etc in other postcode areas. In either case the comment has little relevance, since, on the one hand, it is already. acknowledged that GCL is the only significant single polluter in the postcode area, while on the other it is irrelevant how GCL compares with other polluters elsewhere.

BGSP Alliance submission - air quality

In fact, a study of the NPI data for postcode area 2422 shows that, in aggregate, GCL is responsible for about 30% of all of the emissions covered in the NPI Table1 list.

However, this rises to almost 100% for many items considered individually, including Particulate Matter 10.0 micron. For PM 2.5 micron, associated with high levels of health risk, it is identified as the sole emitter.

But the primary concern here is not GCL's relative standing as a polluter in postcode area 2422, but the fact that its emissions are concentrated in one locality, and that AGL's proposed Stage I development area overlaps the Stratford mining lease to a considerable extent.

The only valid approach to assessing the air quality impacts of the Proposal is to establish the existing level of exposure to pollutants of the population in the vicinity of the Stratford Mining Lease, and then to extend these measures to incorporate the additional effects should the proposed development be allowed to proceed.

As it stands, the EA takes no account of the existing situation, and proceeds to model air quality impacts on a stand-alone basis.(They also seem to consider that air-borne pollutants don't travel far, but this aspect needs another careful reading).

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SECTION 14 – NOISE & VIBRATION
This section deals with noise and vibration from a nuisance perspective. Refer to the relevant section for comment on noise and vibration from a health perspective.

General Comments
Noise assessment studies appear to be focused on assessing noise from the perspective of contributing to industrial deafness rather than from the perspective of noise as a nuisance which causes loss of amenity and disturbance of sleep and well being. Mitigation measures which seek to isolate the receiver from the noise source are often suggested eg double glazing of windows rather than measures which seek to reduce the level of noise at the source.

Another weakness of noise assessment studies is that they focus on levels of noise without regard for the source or type of noise. For example, a rushing waterfall in a bush setting may create a sound pressure level that could be described as loud. However, this would be far less intrusive and upsetting than an identical (or lesser) sound pressure level caused by industrial machinery operating in that same environment. Similarly, the sudden, raucous call of a nearby Kookaburra would be louder but less intrusive than a persistent, low level and distant industrial hum.

The stage 1 project area is a relatively closely settled rural environment. It is very peaceful with extremely low-level background noise. Any low-level industrial noise quickly becomes intrusive against this background.

The Stratford coal mine/colliery is the sole industrial activity in the area. The current noise disturbance from the coal mine to people living up to six or more kilometres from the source has shown the impacts predicted by the original noise assessment for the mines approval to be grossly underestimated. Consequently, we are dubious about claims that the project will not result in cumulative noise impacts.

Table 14.16 has been included "to assist with understanding of predicted noise levels". However, the noise assessment is mostly presented in technical jargon and comparative tables which makes it almost incomprehensible. The average reader is expected to be reassured by generalities such as "the noise impacts of an operating well upon surrounding residential properties is considered to be insignificant" (Main Report Page 14-11).

<u>Recommendation</u>
The Noise Assessment is too narrow and technical to enable individual landholders to assess the impact. The report should state clearly in plain, non-technical English at what distance from a wellhead and the CPF noise will no longer be audible

Specific Comments
Indicative well site constraints
The map showing well site constraints (Vol4, Figure 5.4) does not accurately identify all residences in and adjacent to the Stage 1 GFDA.

For example, 5 residences along Glen Rd just outside the GFDA (and visible on the photo underlay) are not marked. All of these unmarked residences are within 2km of

one or more indicative well sites where site clearing and fraccing are predicted to exceed noise target goals at all hours, and drilling is predicted to exceed noise target goals during evening and night time hours.

Recommendation
This map should be redrawn to accurately identify all potentially affected residences. This should include all residences within 3km of an indicative well site.

Predicted Noise Levels from Construction Activities
Predicted noise levels from construction activities in Stage 1 GFDA exceed noise target goals at distances up to 3km from the activity. (Append. H, Table 30)

With the exception of gas gathering system installation, all listed activities exceed the daytime target goals at 1km, and exceed all night time target goals at 2km.
Well construction, site clearing and fraccing exceed evening noise target goals at 3km.

Recommendations
Core noise control and mitigation requirements should be set as conditions of the project approval, and not left for later development in a noise management plan. This is consistent with the Atkins Acoustics' recommendation that the potential for noise impacts be considered in the preliminary planning phase of the project so that noise minimisation can be built into the inherent project design.

Gas well construction (including drilling) and fraccing should be restricted to standard daytime hours at all sites within 2km of a residence.

Use of noise control and mitigation measures such as use of temporary acoustic screens during drilling and wellhead construction should be mandatory at all sites within 2km of a residence.

Measures cited by Atkins Acoustics (Append H p53) as "readily available" should be required to be applied to all activities, particularly drilling and well construction, within the GFDA. These include plant selection, rig orientation and work practices.

Consultations with "affected receptors" concerning noise mitigation and management should include *all* receptors in the radius within which the relevant target goals are expected to be exceeded, eg within 3km for fraccing at any time.

Draft Commitments – Concept Area
The draft Statement of Commitments - Concept Area – concerning noise (s.26.2.1) is so qualified as to be worthless:

> As a guide, the following general principles would be considered when identifying potential well site locations for the Concept Area. The potential for noise impact would be considered in the preliminary planning phase….

BGSP Alliance submission - noise and vibration

> The full range of available mitigation measures would be considered and applied where necessary to ensure that noise impacts can be maintained at an acceptable level.

Recommendation
Stronger commitments should be required in relation to noise minimisation. At the least, the hedging introduction to item 15 of the commitments should be deleted.

Construction Hours
The project description (section 5.4.13) asserts that drilling activities would need to be undertaken on Sundays as well as during evening and night time hours. Similarly, it is asserted that fraccing would need to be undertaken seven days a week.

A shortening of the total duration of wellhead construction would not justify the noise nuisance and sleep disruption caused to residents within 2-3 km of a well head.

A strong justification should be required for undertaking these works outside the recommended standard hours. No such case has been made.

Recommendation
Approval to undertake construction activity outside standard daytime hours should not be given simply on the grounds of expediency or convenience of the proponent. This is particularly important since these activities are expected to exceed night-time noise target goals as far as 3km from drilling sites.

CPF Operational Noise
Atkins Acoustics concluded that additional secondary engineering controls would be required for the CPF to meet project operational noise goals (Appendix H p.35). Atkins Acoustics has recommended that a further detailed operational noise assessment of the CPF plant be undertaken following final plant selection and detailed design to establish operational noise levels and inform detailed design of noise mitigation for the plant.

There is no indication that the proponent has taken account of the record of actual noise impacts of the Gloucester Coal processing plant (adjacent to one of the possible CPF sites) when modelling the potential noise impacts of the CPF.

Recommendation
To minimise noise impacts of the CPF, the proponent should be required to identify and apply best practicable technology in the selection and operation of noise sources including generators, compressors, cooler fans, pumps and valves and that these be located in the highest standard acoustic enclosures. Modelling of the sound "footprint" of the CPF should have regard to the record of actual sound impacts of the Gloucester Coal processing plant at Stratford, particularly the impacts of intrusive intermittent noise, as evidenced by complaints made by surrounding residents

Well Head Operational Noise
Inadequate information is provided to assess the likely impact of operational noise from the indicative 110 well heads. In particular, more information must be provided on the expected noise levels from the electricity generators to be located at the well heads.

The adequacy of the draft commitment not to establish a well head closer than 200m from a residence should be reviewed in the light of this further information.

Recommendation
Detailed operational noise assessment of the well head plant and equipment should be undertaken following final plant and equipment selection and detailed design to establish operational noise levels and inform detailed design of noise mitigation for the wellhead operations.

No well head should be established where the operational noise impact of the well – after implementation of mitigation measures – would be intrusive, ie where the LAeq 15 min level exceeds the RBL by more than 5dBA.

……

SECTION 19 - HERITAGE

1. OVERVIEW

The Environmental Assessment fails to adequately address non-indigenous heritage. It does this by:

- downgrading heritage to low priority despite it being identified in the Director General's Requirements in the a "Key Assessment Requirements' (see Vol. 1, ES 17);

- failing to assess the significance of the *Vale of Gloucester* by dismissing it as not being relevant (see for example Vol. 1 page 19.5; Appendix K 46);

- failing to assess the impact of the proposed development on heritage vistas;

- failing to understand and apply heritage assessment principles.

An understanding of the valley's heritage significance, including its scenic qualities, is of the highest importance in undertaking an assessment of the valley's environmental qualities and its social/economic base. The danger that arises from the inadequate assessment of Stage 1 is that these qualities will continue to be eroded by successive stages of development being assessed to the same standard. The result will be that the valley's special significance will be permanently lost.

This is vividly illustrated by the proposed second stage, which will be located to the north of Stage 1 on and near the Avon River flood plain. This is a most sensitive area environmentally, scenically and socially and will require the most rigorous of environmental assessments if gas extraction is to be accommodated without severe impact on the area's qualities.

The conclusion is that proper assessment standards should be put in place from the beginning.

2. THE VALE OF GLOUCESTER – HERITAGE SIGNIFICANCE

The *Vale of Gloucester* was recognised by the National Trust of Australia (NSW) as a cultural heritage landscape in 1975 and is among the earliest cultural landscapes so identified in New South Wales. The listing for the Vale of Gloucester sits in the National Trust Register along with other highly significant conservation areas such as the Kosciusko Alpine areas, Lord Howe Island, Parramatta Park and the Cumberland Plain Remnant Communities.

The Vale of Gloucester was entered onto the Register of the National Estate but the entry was not finalised before the register was abolished on 1 January 2004, with the result that additions or changes were not allowed after that date.

The above assessments were brief and referred to the Vale's special scenic and historical qualities. The Barrington-Gloucester-Stroud Preservation Alliance commissioned a more extensive professional assessment in 2009, copies of which have been sent to all relevant bodies, including the Department of Planning. The

heritage assessment, *The Stroud-Gloucester Valley & the Vale of Gloucester: A heritage landscape under threat*, considers that the Gloucester Valley has heritage significance at local, State and National levels for historical, aesthetic, social and technical/research reasons. This assessment will be used as a basis to gain formal State and National recognition.

3. THE DIRECTOR GENERAL'S REQUIREMENTS

The Director General's Requirements state that the EA must include an assessment of the key issues, among which is included the following requirement:

Indigenous and Non-Indigenous Heritage – the EA must include a justified and tiered assessment of impacts to indigenous and non-indigenous heritage, including;

… and; sufficient information to demonstrate the likely impacts of the proposal on non-indigenous heritage values (including heritage vistas) consistent with the guidelines in the *NSW Heritage Manual*. Where impacts to State or local non-indigenous heritage items are proposed, a statement of heritage significance must be included and measures identified to mitigate and manage impacts.

4. FAILURE TO MEET THE DIRECTOR- GENERAL'S REQUIREMENTS

The Environmental Assessment downgrades heritage

As noted above, the first step in downgrading heritage issues was to identify heritage as a low priority issue under Prioritisation of Issues, despite the Director-General identifying it as a key issue (see Main Report, Volume 1, ES17).

Failure to assess the significance of the *Vale of Gloucester*

The assessment, both in the Environmental Assessment and in Appendix K, noted the identification of the *Vale of Gloucester* as a culturally significant landscape for historical and scenic reasons but determined not to assess it. Appendix K, page 46 notes that the panel recommended that the *Vale of Gloucester* be assessed but that the Commission deferred it. This is a puzzling decision which means that the principal heritage assessment of the area would not be undertaken and one of the Director-General's key assessment requirements would be ignored. (The 'Commission' was not identified by the Appendix.)

Incorrect statements about the heritage significance of the *Vale of Gloucester*

Failure to undertake an assessment of the *Vale of Gloucester* led to the Environmental Assessment making a number of general statements about the Vale's significance that are incorrect. For example, the Assessment refers to the Vale's significance as being historical but fails to acknowledge aesthetic significance (scenic qualities), scientific significance (geological qualities) and social significance.

The Vale's scenic significance is one of its outstanding qualities that has led to it being described in the most eloquent terms on many occasions and being visited and painted by Australia's greatest landscape painter, Sir Arthur Streeton.

The Environmental Assessment, Volume 1 page 19.8 claims that the historical significance is based on Robert Dawson's discovery of the Vale in 1826. This is simplistic to the point of being erroneous. The Vale's historic significance embraces a broad range of events and themes, among them;

- the beginning of free settlement on the New South Wales North Coast;
- the use of convict labour;
- its association with the Australian Agricultural company as the first of the large scale pastoral companies in Australia;
- its association with the beginnings of Australia's wool industry;
- the growth of later agricultural industries such as dairying;
- the timber industry.

Misleading statements about the percentage of land area impacted upon.
The Environmental Assessment Volume 1, page 19-8 seriously misleads when it states that the Gloucester Field Development Area covers 16% of the area of the *Vale of Gloucester*. The purpose of the statement is to make the area impacted upon appear relatively minor but the assessment fails to note that this is a highly visible, central part of the area. The only part of the valley floor that is perhaps more visible and more susceptible to adverse impact is the area immediately to the north of the field area, which is marked for development in the next stage. The consequences of failing to properly assess the present field area and the next field area could prove disastrous to the valley's scenic, heritage and social qualities.

This failure to properly address the impact is compounded by the claim (page 19-8, last paragraph) that the gas wells will not 'detract from the essentially rural nature of the area' but provides no assessment of how that conclusion is drawn. The further claim that there will be no impact on the 'more outstanding features of the landscape' (the bordering ranges) compounds the failure to address the impact on the valley floor and leads to the inference that an adverse impact is expected.

5. THE VISUAL ASSESSMENT FAILS TO ADDRESS THE DEFICIENCIES IN THE HERITAGE ASSESSMENT

Despite the rhetoric of this section, this section fails to address the scenic impact of the development in a manner that conforms to the Director-General's requirements to assess the impact on heritage vistas. Section 18 Visual addresses the visual impact from areas within the proximity of the development but does not address the impact on 'heritage vistas'. This deficiency applies to development within the Gas Field Development Area generally and to the Central Processing Facility.

As well as the above deficiency, Section 18 provides an assessment that relies on jargon and technical testing methods and is obscure and inconclusive.

6. ASSESSING THE IMPACT ON HERITAGE VISTAS

Understand the valley's heritage significance
The first requirement is to undertake a heritage assessment of the Stroud-Gloucester Valley to gain an understanding of the area's heritage significance. (A copy of *The*

Stroud-Gloucester Valley & the Vale of Gloucester: A heritage landscape under threat has been provided to assist with this assessment.) The relationship between the various components that contribute to the area's significance should be understood. In particular, the community's association with the area's scenic qualities should be acknowledged. This extends beyond mere appreciation of the amenity and meets the requirements for social heritage significance under the Heritage Council guidelines.

Measure the area's scenic significance

A 'measurement' of the area's scenic significance should be made based on the enjoyment and use of those scenic qualities. This method is widely used in a number of overseas countries, particularly the US where it provides that an area's scenic qualities can be classified as being of local, state or national significance. The method involves assessing or estimating the visitation numbers and their locality of origin. It is clear from statistical and empirical evidence that the Stroud-Gloucester Valley has a high visitation rate and that a high percentage of that is from further afield in NSW and Australia.

This leads to the assessment that the valley's scenic qualities are of state significance but that there is also a degree of national significance. This assessment should also consider that the Stroud-Gloucester Valley is adjacent to the Barrington Tops World Heritage Area and that the valley is therefore an area of state and national significance that is complementary to the World Heritage Area.

Assessing views and vistas

The assessment should identify and consider the significance of both individual views and views of a more sweeping nature from within the area and into the area from major vantage points. It should identify important viewing points and lines of travel, particularly those that are widely used, and assess the impact of the development from those. Viewsheds should be calculated for proposed items within the development area to establish their overall visibility and their impact on the area's scenic qualities rather than only their visibility from limited points in the immediate area (the assessment has partially done this but needs to develop this further to provide clearer assessment of the impact on scenic vistas).

……..

SECTION 20.0 - SOCIO-ECONOMIC IMPACT

OVERVIEW

Chapter 20 in the EA purports to deal with the socio-economic implications of the proposal. Of this, the Director General's Requirements (DGR) stated that the EA must include:

> A **conclusion justifying** the concept plan as a whole and each of the part projects taking into consideration . . . social and economic impacts . . . and the public interest

This casts a wide net. The scope of the project under consideration is such that its consequences are manifest at several geographic scales, ranging from the immediate environs of Stratford, to the Gloucester Stroud Valley, and thence to the entire State of NSW, and also to the Nation as a whole.

One example of national concern is the Lower Hunter Wetlands, ranked as being of world significance. As the Commonwealth Government has now taken this aspect under control it is to be hoped that stringent criteria will be applied.

Another is the prudent management of the nation's energy reserves. Arguably, this should be the subject of a Commonwealth policy which balanced present needs against those of future generations, while also giving full weight to other concerns, such as the preservation of agricultural productivity. Unfortunately, as matters stand, this is an area which is subject entirely to the exigencies of state politics.

Provision of a new source of gas supply to residents of the Sydney conurbation is clearly a matter of interest to them, as it is to the politicians whose electorates are situated there. It is also possible that parts of the Lower Hunter sub-region might derive some benefits.

However, whatever benefits may accrue to Sydney residents, these will be achieved at no cost to them. Communities located along the 80 km length of the pipeline will be affected to some extent, and we trust that spokespersons will be found in each of these to articulate local concerns.

It is patent, however, that the main burden of the social and environmental costs of the proposal will be borne by the residents of the Gloucester Stroud Valley. It is here that the 300 or so gas extraction wells will be located, as well as the processing plant, and waste water management facilities. Furthermore, these intrusive activities are forecast to persist for some twenty years or more.

The primary focus of this assessment should therefore be on the residents of the areas directly affected, namely the Gloucester Stroud Valley (GSV) stretching, in this case, from north of the town of Gloucester to the vicinity of Booral, and it is our belief that, in addressing the DGR, the proponents should place primary emphasis on this area.

Indeed, in the opening section to Chapter 20 the authors state that:

> This chapter details the demographics (sic) of the Gloucester Shire LGA, the local and regional economy and workforce trends, and details potential impacts on the local area, the Hunter Region, and NSW.

And they further add:

> This assessment of socio-economic impacts has focussed on the local socio-economic impacts upon the Gloucester Shire LGA, as the Project is considered to have the greatest potential socio-economic impact in this region due to the concentration and duration of activities in the Stage I GFDA.

So far so good. It is against this backdrop of expressed good intentions that the actual content of Chapter 20 can be now be reviewed.

GLOUCESTER SHIRE DEMOGRAPHY

Although Section 20.2.1 promises to describe the population characteristics of Gloucester Shire, in about two and a half pages it provides virtually no relevant detail. A total population of 4,800 persons is cited for 2006, but no comparative values for other Census years are quoted. It then remarks that between the 1996 and 2006 censuses "a total decline in growth rate of -0.2% occurred".

This is doubly confusing, as it is not clear whether the authors are referring to an 0.2% decline in the population ***growth rate*** per se, or to a change in absolute numbers, nor it is clear whether this statistic represents an annual average, or a total for the ten year intercensal period.

The following page (20.2) consists mainly of a comparison of selected population parameters for the State, the Hunter Region, and its sub-regions, with an occasional reference to Gloucester Shire. Sandwiched in is the following observation:

> The ageing demographic (sic) and falling proportion of younger workers indicates the need to provide services and infrastructure as well as incentives to retain and attract young people to the region, **in particular Gloucester**, to maintain the economic viability of the region.

This ignores the fact of an established secular trend in Australia towards an increase in the proportion of the population aged sixty-five and over. In the case of Gloucester it also ignores the presence of a significant proportion of retirees (although this fact is noted elsewhere in the EA).

It is not clear why the authors were motivated to advance this declaration about the economic viability of a region (or sub-region), as they do not elaborate on their statement. One surmises that they are of the opinion that an economy such as that of Gloucester Shire cannot be "healthy", unless some unspecified minimum proportion of the workforce are "young" people. It is possible that there was an intent to imply that if the Proposal were to receive planning approval, then this would contribute to

some extent in correcting the perceived imbalance in the age structure of Gloucester's workforce.

Page 20-3, and the first half of page 20-4, provide further details, of a quasi-anecdotal character, of the industries present in the Shire and of the community services available. This has no apparent relevance to an analysis of the social and economic impacts of the Proposal, either on the residents of the GSV, nor on those of Gloucester and Great Lakes Shires as a whole.

Generally, it appears that the material in Section 2.2 has been largely culled from the HVRF (2008) and HDB (2006) reports, as cited in the bibliography, and has been re-hashed as padding without further consideration of its relevance.

SECTION 20.3

This three page section deals with "Potential Impacts", primarily organised under sub-headings for the construction and operational phases. It is noted that short-term benefits could accrue to the local economy during the construction phase, but no attempt has been made to quantify these. It is also suggested that some construction jobs might be taken up by local residents, but, given that there is already a skilled labour supply shortage in Gloucester, this is hardly a compelling argument for approval of the EA.

Despite the relative temporal spans of the two phases, discussion of the perceived Socio-Economic impacts for the construction phase occupies just over two of the three pages, while those for the operational phases are dealt with in less than one page. Not much is said in the latter. There is a reference to the "foreseen closure" of Gloucester Coal operations, a term which implies imminence, though no timeframe is mentioned. In fact Gloucester Coal's current "Vision" for the GSV envisages open-cut mining continuing beyond 2030, and this date is cited elsewhere (Section 11.3) in the EA.

Still, the opinion is advanced that the Project:

> . . . would potentially offset, to a certain extent, jobs lost in other declining industries in the Shire such as agriculture and forestry.

In their conclusion to Chapter 20 the authors state (rather limply) that:

> The Project is not anticipated to result in significant negative impacts to the socio economics of the local Gloucester Shire … [but the Shire] . . . may experience positive impacts associated with demand for local goods and services . . ..

THE REALITY

It is our contention that Section 20.0, despite contributing eleven pages to the bulk of a 470 page Environmental Assessment, offers no material of significance.

We submit that the proper focus of a "Socio Economic" assessment of the consequences of the Proposal should be on the people who are directly affected, namely those who reside within the proposed gas extraction fields, with the addition of those residing outside that area who might also suffer adverse consequences.

The potential effects may be grouped under five main headings, listed in approximate order of importance:

(1) Physical Health

(2) Psychological Health

(3) Social disruption

(4) Consequences for the local economy

(5) Property value loss.

The first three of these relate more to impacts on people as individuals and as family and neighbourhood group members, and are dealt with elsewhere in this document. The last two items are discussed below.

THE LOCAL ECONOMY

The Gloucester economy is comprised of a nucleated service centre, with a population of about 2,500, together with a service area which embraces the whole of the Shire and extends a little further to the east and south. The population of this service area is of the order of 3,000 people, mainly engaged in primary production, but with a significant proportion of retirees. Tourism is a prominent element of the service sector, as is acknowledged in the EA.

All observable indicators support the proposition that the Gloucester economy is in a state of functional dynamic equilibrium, and that the residents, with the exception of those currently affected by open-cut coal mining, enjoy a reasonable quality of life.

Nothing in the EA as it stands supports a conclusion that the Proposal, if it were to proceed, would make a positive contribution of any significance to the existing economy, nor, with one critical exception, is it likely to have negative impacts.

The exception is tourism. The tourist industry in Gloucester has been built on the area's scenic values, and the opportunity to pursue a range of recreational activities in a pristine environment. It is, quite simply, an attractive and popular holiday destination.

It may be that coal mining has already had an adverse impact on this image, but measures are not yet to hand. The addition of the proponents gas field would have the potential to conclusively reverse this image, so that the GSV would come to be perceived as just another polluted quasi-industrial area.

LAND AND PROPERTY VALUES

As noted in Table 7.5 (page 7-9) of the EA, and again in Table 7.6 (page 7-21), the question of the possible impact of the gas well network on property values emerged as an issue of community concern. In each instance, the right-hand column of the table provides a cross-reference to Chapter 11, where, by implication, one would expect to find a discussion of the issue. **However, Chapter 11 is silent on the matter.**

In fact, a search through Volume 1 of the EA for the terms ***'land value'*** and ***'property value'*** produced no occurrences other than the two cited above. A search on the term ***'valuation'*** did produce some hits, but none which were relevant to the present issue.

So, despite the question of property values having been raised in both agency and community consultations, it appears to have been given no further consideration in the EA.

Yet it is patently obvious that the gas well network in Stage One, which spans the rural subdivisions along Fairbairns Rd, and runs up to Jacks Rd, will have a negative impact on property values there. The effects of later expansion around Gloucester township, if approved, would be even more serious.

CONCLUSION

Chapter 20.0 provides no information of relevance which would contribute to an appreciation of, and insight into, the current structure and operation of the Gloucester economy.

Specious claims are advanced as to possible "benefits" which might accrue to the local economy, but without substantiation, while the possibility of adverse impacts on the tourist industry is brushed aside.

And finally, although the question of property values is acknowledged as a concern, no discussion of this has been provided anywhere in the EA.

…….

SECTION 24 – CUMULATIVE IMPACT

1. CUMULATIVE IMPACT IGNORED

An assessment of cumulative impact has been omitted from the assessment despite its critical importance in assessing all environmental impacts. Section 24 of the Environmental Assessment is a brief and superficial section totalling slightly in excess of one page. It dismisses cumulative impact as not applying to the Stage 1 development area or to the Concept Area, with the exception only of the Queensland Hunter Gas Pipeline (QHGP) Project (MP06-0286) and the Hexham Redevelopment Project (MP07-0171), both of which are at the extreme southern end of the project area. As such they have no bearing on cumulative impact in the Stage 1 area or the project area generally.

Cumulative impact assessment of the Stage 1 area should be undertaken in regard to the Gloucester Coal Ltd present coal mining projects in the Stratford area and the future stages of the AGL gas project in the Gloucester area. The AGL Environmental Assessment should consider future stages of the AGL proposal now because these are known to AGL, form part of the ongoing development and assessment is required under the concept plan application. The total number of gas extraction wells is presently uncertain but advice from AGL and elsewhere indicates that the number will be considerably in excess of 300 and probably about 450. These will extend both southwards and northward and will eventually encircle the Gloucester township.

Cumulative impact will affect all aspects of the environmental assessment. The examples briefly addressed below are illustrative rather than exhaustive.

2. HEALTH

This is addressed under the relative section on health impact but, as noted above, cumulative impact health should be assessed in regard to both future stages of the AGL development and to the existing and proposed Gloucester Coal development. Section 9.2.1 of the assessment states that the pollutants of particular concern to this project area are;
Nitrogen Dioxide (NO2)
Carbon Monoxide (CO2)
Particulate Matter (as PM_{10})
Volatile organic compounds
Formaldehyde
Odour

The impact of these pollutants is not adequately addressed in regard to the eventual number and location of wells and from that the levels of pollutants and their potential toxicity. **Of critical concern is that their combined impact with coal pollutants has not been addressed - these gases will react with the coal dust pollution presently occurring from existing coal mining with potentially toxic results (see the submission on health impact).**

Noise levels from the AGL project have not been adequately assessed as noted in the relevant section; in particular the cumulative impact of noise from the total number of wells and supporting infrastructure has not been assessed. Existing noise levels from

the Gloucester Coal Ltd's Stratford mine are a matter of community concern but the cumulative impact of the AGL project in combination with these noise levels has not been considered. This is a serious omission that urgently requires assessment.

3. LAND USE

The economic impact of the development on agricultural and residential land use has not been adequately considered in the environmental assessment. It follows from this that the cumulative impact with future stages of the gas development and existing coal mining projects has not been assessed. These will cause an increasing encroachment onto both rural and future residential land and an increasing use or sterilization of land for access, safety and buffer zone purposes.

4. HYDROLOGY AND WATER QUALITY

As noted at the relevant part of this submission, the impact of the proposed development has not adequately addressed impact on ground water and surface water. This is of critical concern considering the amount of water that needs to be withdrawn (total withdrawal is required) in the gas extraction process. The cumulative impact of all stages of the development should be considered now as should the cumulative impact of these stages with existing coal mining projects.

5. SCENIC-HERITAGE QUALITIES

The inadequate assessment of the project's impact scenic-heritage qualities is a serious deficiency referred to in the relevant part of this submission. The environmental assessment downgrades heritage impact from a key requirement to low priority and then dismisses the 'Vale of Gloucester' as not requiring assessment.

This deficiency is then compounded by not assessing the progressive impact that the Stage 1 development will have when combined with the further gas mining stages and the existing/proposed coal mining in the Stratford-Gloucester area. The gas project will have an immediate scenic-heritage impact caused by the construction and installation of infrastructure but this will be ongoing because of the developments further stages. The 'Vale of Gloucester' will be marred by the large scale gas fields and their network of access roads and tracks. Combined with coal mining, this will mean that eventually Gloucester will be situated in a scarred industrial landscape devoid of its once important scenic-heritage qualities.

6. CONCLUSION

In conclusion, the failure to address cumulative impact is a serious deficiency that affects the integrity of every part of the environmental assessment.

……

SECTION 28.3 - ECOLOGICALLY SUSTAINABLE DEVELOPMENT

1. SUMMARY

This submission considers that the AGL Environmental Assessment fails to adequately consider the principles of Ecologically Sustainable Development as required by law despite acknowledging the requirement to do so. This submission considers that two principles, the precautionary principle and intergenerational equity, are relevant to the project.

The submission urges the Minister not to approve the project because of this serious omission.

2. THE REQUIREMENT TO CONSIDER ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The requirement to consider Ecologically Sustainable Development is now a settled point of planning procedure. The *Environmental Planning and Assessment Act* 1979 (NSW) states that one of its objects is to encourage ecologically sustainable development. In *Gray v The Minister for Planning,* Pain J considered that there is ample case law that requires ESD principles to be considered in all decisions made under the *Environmental Planning and Assessment Act*, including those made under the Part 3A provisions.

Ecologically Sustainable Development is defined as having the same meaning as the *Protection of the Environment Administration Act* 1991 (NSW), which states that ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. It then provides that ecologically sustainable development can be achieved through four accepted principles:

- the precautionary principle;
- inter-generational equity;
- the conservation of biological diversity;
- improved valuation, pricing and incentive mechanisms.

As noted above, the submission considers that the precautionary principle and intergenerational equity are applicable to the AGL gas project and are required to be assessed.

3. THE PRECAUTIONARY PRINCIPLE

Background

The precautionary principle has been well articulated in Australian and overseas planning law. For the purpose of this submission, reliance is placed on Chief Justice Preston's judgement in *Telstra v Hornsby Shire Council* [2006] NSWLEC 133 and His Honour's subsequent paper *Principles of Ecologically Sustainable Development*, November 2006.

Preston CJ notes that there are numerous formulations of the precautionary principle but that the most widely employed formulation is 'if there are threats of serious or

irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.

His Honour considered that two conditions precedent are required to trigger its application; a threat of serious or irreversible damage and scientific uncertainty as to the environmental damage that may result. Mere suspicion or concern does not meet the threshold required to satisfy a threat of serious or irreversible damage; there must be a level of scientific evidence even if that evidence falls well short of proof with scientific certainty.

The Environmental Assessment incorrectly interprets the Precautionary Principle.

The Environmental Assessment incorrectly states at 28.3.1 (1st paragraph) that 'it requires avoidance of serious or irreversible damage to the environment, whenever practicable'. This is incorrect, the condition 'whenever practicable' is not part of the precautionary principle - the precautionary principle requires avoidance, there is no modifying condition. If this condition existed there would in effect be no precautionary principle.

The Environmental assessment at 28.3.1 (2nd paragraph) that 'the Project has taken on board the precautionary principle by carrying out detailed environmental investigations…'. This premise is not supported by the content of the Environmental assessment, which has avoided a number of key assessment requirements. It should be noted that the Environmental Assessments attempts to postpone a number of issues until after approval is given – this is completely contrary to the concept of the precautionary principle.

The deficiencies in the Environmental Assessment's understanding of intergenerational equity at 28.3.2 can similarly be noted.

Meeting the required threshold to invoke the Precautionary Principle

This submission considers that there is sufficient scientific evidence to invoke the precautionary principle in regard to gas migration, water degradation, water and soil pollution and water table damage, and to therefore place the burden of proof to the contrary on the proponent of the development. The evidence is referred to below.

The F.C. Loughnan report. The Gloucester Basin is particularly prone to methane gas migration for the same reasons that traditional pit mining was considered dangerous. This problem was noted in coal mining assessments in the 1950s when geologist FC Loughnan (1954) concluded that a high water table along with faulting and buckling in the strata make traditional pit mining in the Gloucester Basin extremely difficult. Loughnan further considered that no other area in New South Wales presents such an opportunity to study the rapid succession of differing tectonic environments as does the Stroud-Gloucester Trough. He particularly noted the occurrence of late E-W compressional stress of a high magnitude, which superimposed new structures on the pre-existing structures. These characteristics mean that the Gloucester Basin is also unsuited to coal bed methane gas extraction.

Gas eruption and the Atkinson report. An eruption of methane gas has already occurred in the Gloucester Valley. In September 2004, within a fortnight of test drilling beginning, coal bed methane drill hole LMG-03 at Stratford was shut down when methane gas erupted from old boreholes up to 300m away. The report *Coal Bed Methane Hazards in New South Wales*, by CM Atkinson (2005) notes that this was the first reported case of serious migration of methane gas from coal bed methane operations in New South Wales. That incident resulted in work being halted and a number of boreholes being sealed with concrete.

Commentary by Professor Alex Grady.(Professor Grady has 35 years as a geologist specialising in structural geology and also has extensive experience as a geological field mapper. He extensive field experience in NSW, South Australia, Western Australia, the Northern Territory, New Zealand and Eastern Indonesia. He was during that time a Member of the Australasian Institute of Mining and Metallurgy and of the Geological Society of Australia and retains membership of the Geological Society of Australia.)

Considerable reliance is placed on comments received from Professor Alex who reviewed the AGL Environmental Assessment in relation the geological characteristics of the Gloucester Valley for the purpose of this submission. Extracts from his commentary are noted below and a copy of his commentary follows this section of the submission. We urge the Department of Planning to read this commentary in full.

> It seems to me that their understanding of the local and subregional hydrogeological situation leaves a lot to be desired. The potential for fractured rock increasing porosity/permeability of otherwise "tight" geological formations, raises the possibility that there could be at least local hydrological connectivity between the coal seams and other aquifers. The densely spaced, complex systems of faulting, raise the possibility of fault-induced juxtaposition of coal seams and non-seam aquifers - and hence inducing hydrological connectivity of those seams with other aquifers.'
>
> I think that you can see from what I have written, that I sense a major lack of understanding of the potential hydrogeological situation, together with a consequent lack of an adequate monitoring system and program, required in order to understand the hydrogeological repercussions (short and long term) of what is proposed in the project.

Land degradation has become a major issue in many overseas gas fields, particularly in the United States, but Australian gas fields have not been free of this devastation. Soil poisoning at the Bohena wells near Pilliga New South Wales provides alarming evidence of the extent of environmental degradation that coal bed methane gas extraction has caused in Australia. Atkinson (2005) described it as one of the worst cases of sodic soil poisoning reported and as being worse than the cases described from the Powder River Basin in USA, which have attracted continuing international attention.

There are increasing health concerns supported by increasing data. Overseas issues, mainly in the United States, include stock deaths from grazing in the vicinity of gas wells and increased cancer rates in the immediate areas. These are serious issues that

require full and open examination but are instead being ignored and hidden from examination in the Australian context.

4. INTERGENERATIONAL EQUITY

The Principle of Intergenerational Equity's strongest application is in regard to the scenic-heritage-cultural landscape. It is a settled point by way of relevant definitions and case law that cultural environment is part of the environment and that the principles of Ecologically Sustainable development apply equally to it.

The Stroud-Gloucester Valley was one of the first cultural heritage landscapes identified in New South Wales. It was widely recognised as such by the 1950s and was classified by the National Trust of Australia (NSW) in 1975. This classification depends on the area's early nineteenth century settlement, its outstanding scenic qualities and its geological qualities. These qualities have shaped the area's lifestyle, economic base and self identity. We ask the Department of Planning to refer to the document *The Stroud- Gloucester Valley & The Vale of Gloucester: A heritage landscape under threat*, Barrington-Gloucester-Stroud Preservation Alliance Inc, 2009. A copy of this document was sent to the Department of Planning in July 2009 and a further copy has been enclosed with this submission.

The issue is that the scenic-heritage qualities are being gradually eroded by coal and gas mining. This is intensified by the inadequate assessment of heritage and scenic impact by the AGL Environmental Assessment and its failure to assess cumulative impact. These issues are addressed at the appropriate parts of this submission.

It is clear that the AGL Environmental Assessment fails to understand the impact of the gas project in the Gloucester area, on the landscape generally and on scenery and on vistas that are critical to the area's identity.

Future generations will inherit a degraded landscape that is vastly different to the landscape today. This landscape is not only enjoyed by the present generation but, as noted above, underpins its economic base, lifestyle and self identity.

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FULL SCRIPT OF COMMENTS BY PROFESSOR GRADY REGARDING THE GLOUCESTER VALLEY'S GEOLOGY

Professor Grady to the writer, Garry Smith, 21 December 2010

'I find aspects of the mapped geology as depicted and the geological cross sections to be problematic. There is clearly a lot more to the geology than is shown on the map (*Dungog Geological Series Sheet 9233* (Edition 1) 1991). Furthermore, the way in which the Stroud-Gloucester Syncline is shown on Cross Section AB is difficult to believe when viewed in conjunction with the map and Cross Sections GH and EF. But we must remember that most geological cross sections associated with regional geological maps are very interpretive.

However, we can use with some confidence the following observations.
1. The area in question has been intensely faulted, involving several intersecting arrays of often closely spaced faults. This is the kind of geological situation in which the rocks are usually strongly fractured (fractures due to compaction-contraction during lithification, together with those due to brittle failure during folding and faulting).

This gives rise to secondary porosity/permeability - which can vary considerably from place to place. Most particularly, such effects can produce locally high porosity/permeability zones in rock units that have low primary porosity/permeability (producing what are called "fractured rock aquifers").

2. There are sandstone stratigraphic units within the geological sequence, ones that could well be fairly good local aquifers (although the water quality might not be particularly good). The sedimentary units in the Gloucester Valley area are not pure "layer cake stratigraphy", i.e., sedimentary units are not perfectly continuous in extent or thickness - particularly from east to west. This applies also to the character of the mapped rock units, eg., the distribution of potentially good sedimentary aquifers. The fact that their drilling activity in the pilot project area didn't intersect any, doesn't preclude their existence within the proposed Gas Field area.

3. The complexity of the faulting is likely to have juxtaposed the coal seams with potential sandstone aquifers in many places. This has the potential to make the coal seams 'leaky' in such places'.

Comments by Professor Alex Grady on the AGL Environmental Assessment, viewed by way of a CD version of the assessment.
'The content of the CD is really quite large (as might be expected), so my reading of it has been fairly restricted - to those sections that, on the surface, relate most directly to the geology and to water issues.

1. Water and in-seam gas. It is encouraging to see several text references to the need to reduce the formation fluid pressure to a very low level before the in-seam gas is released by the coal. In practice this seems to mean that the hydrostatic head at the level for gas recovery, needs to be zero (or all 'formation water' needs to have been removed above the gas recovery level). At the very least this will result in a conical or quasi-conical, depending on coal seam boundary geometry, water-free zone above the gas-recovery level.

2. How do they plan to isolate the desired gas-recovery zone from other geological units? They claim that: (a) the coal seams are the principal deep rock aquifers they are likely to encounter, and (b) their drilling/casing procedures will prevent cross-linking the coal seams with other aquifers.

3. Their report of what happened to neighbouring 'core drill holes' (DDH20C and 'an unnamed core hole' about 300m south of LMG03) suggest greater porosity/permeability, within the coal seam sequences not just within the coal seams, than they otherwise admit (See *Vol 1, Ch 13, p 13.4]*

Note the very limited evidence-base they use to interpret lack of hydrological connectivity between the deep rock aquifer and the alluvial aquifer (same page as Point 3 above.)

It seems to me that their understanding of the local and subregional hydrogeological situation leaves a lot to be desired.

1. The potential for fractured rock increasing porosity/permeability of otherwise "tight" geological formations, raises the possibility that there could be at least local hydrological connectivity between the coal seams and other aquifers.

2. The densely spaced, complex systems of faulting, raise the possibility of fault-induced juxtaposition of coal seams and non-seam aquifers - and hence inducing hydrological connectivity of those seams with other aquifers.

The ***permeability of the fault zones*** is not known at all - you might recall my earlier comments about 'sealed' or 'open' faults. They do refer a couple of times to the possibility that some faults might have "weathered" material within the fault zone. Technically, this is known as 'fault gauge'. It is usually crushed/ground-up rock material that has been mineralogically altered to have a high clay content. If there is much of that material within the fault zones, it can have the effect of sealing the fault zone, preventing the transmission of fluids along that part of the fault. The opposite of this is an effect that can be associated with fault-related fracturing of rock, i.e., increasing the porosity/permeability within the crushed rock. If there is much of this effect along a fault, it can become an efficient conduit for movement of fluids along the fault (in the inland Australian situation, many faults can be traced across the landscape by following the linear arrangement of springs - due to the associated faults being preferred conduits for movement of ground water.)

One of the direct repercussions of these matters is that <u>they haven't properly assessed the potential for dewatered coal seam units to become sinks for water from elsewhere</u> (neighbouring geological units, more remote geological units connected via fracture zones or "open" faults, <u>or from surface waters via alluvial aquifers</u>); in fact it might be very difficult to properly assess these possibilities until production has been under way for some time.

They say that they will seal off production seams if they overproduce water. How will they accurately recognise such a situation? If it happens, what will they monitor in order to understand the processes involved? The monitoring systems that they propose almost certainly won't be sufficient to understand the systems (see comments about Management of Impacts below).

Specific Comments on Table 13.1.
Dewatering of Shallow Aquifers - Mitigation Measures:
They don't/won't know if the production zones are leaky at depth. This could be extremely variable from place to place. Sealing individual coal seam zones in the drill hole won't necessarily solve the problem.

Increased aquifer permeability etc - Mitigation Measures:
Potential problem - the pilot program is not necessarily representative of all geological situations to be encountered.

Reduction in stream flow:
Mitigation Measures statement has nothing to do with mitigation measures (!). It is about **monitoring**, not mitigating.

Management of Impacts (page 13.4.1)
Dot point one: Given the extremely faulted/fractured nature of the local geology, monitoring of target seams and shallow aquifers is unlikely to cover all possibilities. They should at least cover contiguous non-seam deep bedrock aquifers as well.

Dot point 2: This should apply to contiguous non-seam aquifers as well.

Dot point 3: As above.

The final statement is effectively a "motherhood statement". How is "where required" to be defined, and by whom?

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Alex Grady.